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ABSTRACT

In 1989, national attention was given to the unusual amount of cooperation and social connections among key policy actors in a major school-finance lawsuit in Kentucky. The case resulted in a judicial ruling declaring the entire state's school system unconstitutional. Accounts of this ruling attributed the unprecedented decision partly to relational ties between the judge and the plaintiff juries. This paper discusses findings of a study that examined: (1) finance reform actors' social network structure; and (2) how this network influenced the trial court judge's decision. Log-linear analysis was used to test the statistical significance of the distribution of mutual ties as a measure of subgroup cohesiveness. Descriptive techniques suggest that the social structure of the finance reform initiators' network was highly mutualistic. The block image matrix shows that plaintiffs not only sought advice from various key resources (education policy consultants, themselves, the trial court's select committee, and the judge), but that those key resources also sought advice from plaintiffs. Key actors could monitor information flow and perhaps strategically frame their legal arguments and political interests to achieve self-interested goals. Defense actors were isolated from the rest of this network. Implications are discussed. Included are 6 figures, 4 tables, and two appendices: sources establishing advice relationships among policy actions in Kentucky; and the "GLIM" Statistical Computing Program used to test log-linear models of Kentucky school finance reform. (Contains 87 references.) (MLH/Author)

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POLITICAL INFLUENCE NETWORKS AND KENTUCKY SCHOOL FINANCE REFORM

April, 1998

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They had bonds of personal acquaintance and friendship... In their continued association they developed to some extent common ways of thinking about the social and economic problems with which they were in more or less constant contact.

---on the relationship between Leland Stanford and Stephen J. Field, United States Supreme Court Justice 1863-1897(Swisher, 1930), p 244.

Mrs. Field and Mrs. Stanford were close friends, and were much together. When after Stanford's death the federal government tried to collect more than fifteen million dollars from his estate to apply on the debt owed by the California railroads to the government, Field, although he wrote none of the court opinions, gave every possible assistance to Mrs. Stanford in protecting her interests. The government failed to collect....Such was the nature of some of the personal and social bonds between Field and the railroad builders.

--(Swisher, 1930) p. 245.

ABSTRACT

In 1989, national attention was given to the unusual amount of cooperation and social connections among key policy actors in a major school finance lawsuit in Kentucky, United States of America. The case resulted in a major judicial ruling that found the entire state's school system unconstitutional. Accounts of the ruling attributed the unprecedented decision partly to the relational ties between the judge and plaintiff attorneys. This study employs archival data to examine the network structure of key policy actors involved in the lawsuit. Central research questions are 1) What was the social network structure of actors involved in school finance reform in Kentucky? 2) How did the social network structure of actors influence the judicial decision at the trial court level? Log-linear analysis were used to test the statistical significance of the distribution of mutual ties as a measure of network sub-group cohesiveness. Findings suggest that network sub-group cohesiveness resulted in attitudinal homogeneity. Implications of social network structure on educational policy formation are discussed.

I. INTRODUCTION

Within the United States, studies of school finance reform through the courts have noted the importance of policy issue networks in setting the agenda of court activity (Kirst et al., 1984; Elmore and McLaughlin, 1982; Guthrie, 1982). Policy issue networks, organized interest groups oriented around an issue domain (Kirst and Meister, 1983), have played a key role in marshalling the appropriate legal theories, technical assistance, social science research, and political information necessary for successful legal reforms in California, New Jersey, and other states throughout the nation. The presence of policy networks has also been noted as a better indicator of judicial and legislative agenda-setting than state categorical attributes (e.g. socioeconomic and organizational) (Kirst and Meister, 1983). Though studies of policy issue networks within education have emphasized judicial agenda-setting, they have not extended the network concept towards understanding how the actual decisions of the judiciary are influenced. This study attempts to do so.

In the 1989 lawsuit, Rose v. Council for Better Education, the Kentucky Supreme Court ruled the entire Kentucky educational system unconstitutional (KY Supreme Court, 1989). Basing its opinion largely upon the trial court's opinion, the Supreme Court ruled in favor with the plaintiffs' primary assertion that the state's funding system was inefficient; furthermore, the court ruled the state's entire instructional program inequitable and inadequate. Whereas previous school finance lawsuits have ruled specific school finance provisions unconstitutional (e.g. California and New Jersey), the Kentucky ruling went beyond school finance and set a precedent of constitutional interpretation that struck down the entire educational system (Verstegan, 1994; New York Times, 1990).

Reports of how the trial court's opinion was produced have noted the unusual amount of cooperation among key policy actors including the plaintiff lawyers, state education officials,

educational consultants and even the trial court judge (Combs, 1991; Dove, 1991; Trimble and Forsaith, 1995). Dove's article "Acorns in a Mountain Pool" in particular documented the social relationships among key policy actors, a local educational policy group (The Pritchard Committee), and an advisory panel (The Select Committee) appointed by the trail court judge to advise him on his ruling. Dove explicitly discussed the "connections" among key policy actors and the formal and informal relationships among lawyers that facilitated communication. Noteworthy were the relations of two particular actors: the lead counsel for the plaintiffs Bert Combs, a former Kentucky Governor, federal judge, and a partner in the state's leading law firm, and Ray Corns, the trial court judge, the former counsel for the Kentucky Department of Education, and co-author of a book on school finance reform.

The patterns of relationships between key policy actors provides an opportunity to examine the influence of social networks in this educational policy context. The purpose of this study is to examine how social networks influenced judicial decision-making. The central research questions are: *1) What was the social network structure of actors in school finance reform in Kentucky prior to the Rose v. Council for Better Education trial court decision?* and *2) In what ways did the social network structure of actors influence the judicial decision of the Rose v. Council for Better Education at the trial court level?* The social network perspective is supported by both theoretical and methodological strategies that recently have been developed within sociology and political science but underutilized within educational studies. Following a review of theoretical and empirical literature, I present research that examines the role of social network relationships in explaining judicial decision making and educational policy formation in Kentucky, USA.

II. REVIEW OF THE THEORETICAL LITERATURE

Overview

The theoretical background of the social network perspective draws from a variety of disciplines including sociology, anthropology, communications, and political science. In tracing the intellectual ancestry of the network perspective, the review is organized into three sections: the relational directive, the duality of structure and agent, and political influence networks. First, the network perspective begins with an emphasis on understanding social behavior based upon relationships. Whereas much of social science emphasizes the study of categories or attributes (e.g. demographic data) and the relationships inferred based upon those categories, the network perspective examines the relationships of actors directly and sees those relationships as properties that guide social behavior. Secondly, the network perspective incorporates the broadly used sociological concept of structure. Structures are patterned interrelationships (Wellman, 1988) embodied in actors' relationships which enable and constrain behavior. Structure guides behavior. However, actors also possess choice, or agency, and work to create and recreate structure. This synthesis of structure and agent, of macro and micro perspectives (Sewell, 1992; Giddens, 1984), is utilized by the network perspective to explain social behavior. Finally, a particular network perspective from political sociology called political influence networks (Knoke, 1990) is presented as the guiding theoretical perspective for this study.

The Network Perspective I--The Relational Directive

The development of the social network perspective and its emphasis on relations began during the 1940's and 1950's in the United States. Studies examining relationships as the linking of social entities arose within the disciplines of sociology and anthropology. Within sociology, studies examined social psychological interactions of groups (e.g. Moreno, 1934) and communication patterns in experimental settings (Bavelas, 1950; Cartwright and Harary, 1968).

Early network studies within anthropology (e.g. Barnes, 1969; Mitchell, 1969) examined the social organization in urban communities.

From these early works emerged a perspective that social phenomena was best seen not as attributional but relational. Proponents have pointed out that much of social science research is categorical, relying upon linear regression models and categorical data analysis. Disciplines such as economics and psychology weigh heavily "individualistic explanations [that] generally ignore the social contexts within which the social actor is embedded" (Wellman and Berkowitz, 1988). For example, one study argued that employment patterns are better explained by the relationships that a job seeker has than his or her demographic characteristics (Granovetter, 1983). Extensions of this argument have been recently articulated by Wasserman and Faust:

> "Rather than focusing on attributes of autonomous individual units, the associations among these attributes, or the usefulness of one or more attributes for predicting the level of another attribute, the social network perspective views characteristics of the social units as arising out of structural or relational processes or focuses on properties of the relational systems themselves (Wasserman and Faust, 1994 p. 8).

In addition to these conceptual divergences, network researchers found utility in the development of graph theory as a means of visual representations of network concepts. Moreno is credited for the development of the sociogram and sociometry --the measurement of interpersonal relations in small groups (Moreno, 1934). The sociogram, a graphical representation of actors and their relationships, enabled sociologists to visualize group structure, which in turn facilitated the study of communication patterns (Bavelas, 1950). Graph theoretical concepts were extended by Moreno and Jennings (Moreno, 1945) and Cartwright and Harary (1968) to advance other social psychological theories (e.g. Heider, 1948). A final virtue in the development of graph theoretical concepts and methods was the formalization of relational structures by mathematical definitions and ways to measure quantitatively those relational

structures.

The relational and graph theoretic approaches have yielded various and often competing definitions; nonetheless, the following key concepts have been recently reviewed and formalized by Wasserman and Faust (1994 pp. 17-20). Key concepts include: actor, relational tie, dyad, and social network . Actors are "discrete individuals, corporate, or collective social units." Examples include natural persons, corporations, and nation-states. Relational ties are "ties between any units including kinship, material transactions, flow of resources or support, behavioral interaction, group co-memberships, or affective evaluation of one person by another." A social network is "a finite set or sets of actors and the relation or relations defined on them," and a dyad is "a linkage or relationship establishing a tie between two actors." From these initial concepts, additional concepts are constructed and analysis of network variables are performed.

In short, the network perspective allows researchers to conceptualize and describe the pattern of relationships among actors and to theorize as to the consequences of these patterns on behavior (Wasserman and Faust, 1994 p. 3). The major assumptions undergirding the network perspective can be summarized as follows:

1. Actors and their actions are viewed as interdependent rather than independent, autonomous units.

2. Relational ties between actors are channels for transfer or "flow" of resources (either material, like money, or nonmaterial, like information, political support, friendship, or respect.)

These two assumptions emphasize the relational nature of social behavior; I now turn to a discussion of the consequences of this relational perspective upon actors' behavior. The network perspective views social behavior as guided by the patterns of these relationships--otherwise known as structure.

The Network Perspective II--The Duality of Structure and Agent

A common presupposition within social science research is that human behavior is patterned. Patterned behavior, or structure, has thus been the focus of research that attempts to generalize and systematically explain social phenomena. Conceptions of structure, however, vary among disciplinary perspectives. For example, within anthropology, "structural anthropology" systematically defines and studies sets of cultural symbols in terms of their patterned interrelationships (Levi-Strauss, 1969). Within sociology, structure may refer to stratification and inequality (Stark, 1985). These forms of structure examine relationships from an abstracted perspective. Cultural symbols are abstract concepts; stratified and unequal patterns in society are presumed from conclusions of distributions of characteristics of units. "Social structures are seen entirely in minds of actors and may not have empirical manifestations" (Knoke, 1990). The consequences of these structures is that human behavior is constrained, and thus predictable, based on such structures.

A major challenge to the structural perspective is the premise that individual actors may make self-interested and rational choices, effectively minimizing or making irrelevant structural concerns. The debate between structure and agent has been reconceptualized by some scholars who acknowledge the importance of both. Giddens presented a theory of structuration that emphasized the duality and mutuality of structure and agency (Giddens, 1979). Giddens rejected the view that structure is only constraining, but rather, it "is both enabling and constraining" and furthermore, "all social actors, no matter how lowly, have some degree of penetration of the social forms which oppress them" (Giddens, 1984 p. 72). Here, structure acts upon and is acted upon by actors; structures enable/constrain actors and are simultaneously reconstituted by them. The duality of structure and agent has been elaborated by Sewell who specified that structures are in the form of "cultural schemas" and sets of "resources" that empower and constrain social

action and tend to be reproduced by that action" (Sewell, 1992 p. 27). Sewell's specification of the types of structures informs (and is subsequently altered by) the network perspective.

The development of the network approach draws from the synthesizing concept of the duality of structure. However, an important distinction is that the network perspective attempts to bring structuralism out from abstract processes into "concrete social relations among specific social actors" (White et al., 1976; Wellman and Berkowtiz, 1988). Granovetter also constructed an argument of "embeddedness" and "stressed the role of concrete personal relations and structure or 'networks'" (Granovetter, 1985 p. 490) within economic sociological circumstances. Knoke criticized the cultural schema approach and argued that the network approach "reveals how socialization processes actually operate to produce normative orientations in situated contexts " (Knoke, 1990). In effect, norms matter, but they arise as a result of concrete relationships between actors and do not originate from within actors (Wellman, 1988). Structure is therefore found in concrete social relationships and not purely subjective phenomenon.

The network perspective utilizes the duality of structure and agent and incorporates dualism into a theoretical framework. The patterns of relationships that constitute the network structure are actors' behavioral opportunities and constraints. Simultaneously, network "entrepreneurs" may exploit their network position to further their own interests (Wasserman and Faust, 1994). Thus the network perspective neither undersocializes nor oversocializes actors (Giddens, 1984), but rather illuminates their behavioral options. In effect, actors can work to reinforce the structure or even change it.

Thus, the network perspective incorporates two more assumptions with respect to structure. Wasserman and Faust summarize the major assumptions that buttress the network perspective (Wasserman and Faust, 1994) :

1. Network models conceptualize structure (whether social, economic, political, and so forth) as enduring patterns of relations among actors.

2. Network models focusing on individuals view these enduring patterns of relations as providing opportunities for or constraints on individual action.

This discussion provides an outline of how social behavior can be conceptualized. The structure of relations among actors and the location of individual actors in the network have important behavioral, perceptual, and attitudinal consequences both for the individual units and for the system as a whole (Knoke, 1982). I now review a specific type of relation and its application within a social network structure--the political influence network.

Political Influence Networks

The specific application of the network perspective utilized in this study stems from political sociology and is known in the literature as the political influence network. This section is devoted to 1) defining power and influence and explaining how studies of political influence are well suited for network analysis, 2) reviewing how sociological conceptions of social comparison form the process by which political influence networks operate, 3) defining structural cohesion within the political influence network, and 4) presenting a statement of the theory of political influence networks and scope conditions.

Definition of Power and Influence

During the 1980's, political scientists adopted the network perspective and methods to study political behavior and decision-making. Representative works include Moore (1979), Knoke (1982), and Laumann (1985). Knoke argued that political behavior readily lends itself to a relational perspective, because power is relational. He noted that "...political science is perhaps a further specification of a kind of behavior that is sought--the relationship between influencer and influencee" (Knoke, 1990 p. 21). Political analysis is primarily concerned with power in

relational terms. Definitions of power vary depending upon particular scholars but they all are relational. Weber defined power as "the probability that one actor within a social relationship will be in a position to carry out his own will despite resistance, regardless of the basis on which this probability rests"(Weber, 1947), and Emerson conceptualized the power of an actor A over actor B as "the amount of resistance on the part of B which can be potentially overcome by A"(Emerson, 1962). These definitions of power reflect the relational nature of political science. A specification of power relevant to this study is "influence." Influence is "when one actor intentionally transmits information to another that alters the latter's actions from what would have occurred without that information"(Gamson, 1968; Parsons, 1963). Influence, therefore, is relational and emphasizes the transfer of information through communication between actors.

Process of Social Comparison

Political influence networks link the structure of social relations to the attitudes and behaviors of those within the network. Specifically, relationships where actors are in a position to influence one another may result in similar attitudes and behaviors. Marsden and Friedkin (1994) identify social comparison as the underlying process for network influence. In situations involving ambiguity, people obtain "normative guidance by comparing their attitudes with those of a reference group of similar others. Attitudes are confirmed and reinforced when they are shared with the comparison group but altered when they are discrepant." Marsden and Friedkin drawn upon Moscivici's (1985) proposition that resolution of conflict undergirds influence and also upon Erickson's (1988) assertion that attitudinal similarity is derived from social comparison. Finally, Knoke (1990) also relies upon social comparison processes to formulate a theory of political influence networks.

In a further specification of the social comparison basis, Marsden and Friedkin also note

that a combination of ties operate simultaneously within social networks (Marsden and Friedkin, 1994). A combination of solidary relationships and hierarchical relationships are at play. Solidary relationships are relationships that emphasize lateral relationships such as friendship; whereas, hierarchical relationships emphasize vertical relationships such as those based on authority. A combination of ties, or multiplex ties, "provide a stable context for the exertion of influence on a variety of attitudes and behaviors" (Marsden and Friedkin, 1994). Therefore, within the social comparison process, different types of ties provide multiple opportunities and dimensions on which actors compare themselves to others and formulate similar attitudes.

Definition of Structural Cohesion.

In accord with Marsden and Friedkin's specification of the process that drives political influence networks, the concept of structural cohesion can be applied to the political influence network. Wasserman and Faust (1994) define structural cohesion as the presence of "relatively strong, direct, intense, frequent or positive ties." The cohesiveness of network actors is associated with the consensus of attitudes and behaviors. Friedkin (1984) elaborates on this definition:

> "Structural cohesion models are founded upon the causal propositions that pressures toward uniformity occur when there is a positively valued interaction between two persons; that these pressures may occur by being "transmitted" through intermediaries even when two persons are not in direct contact; and that such indirect pressures toward uniformity are associated with the number of short indirect communication channels connecting the persons."

Where network structures exhibit increased numbers of direct or positive ties (cohesiveness), similar attitudes can be predicted. Here the underlying process of social comparison results in pressures toward consensus when desired relationships exist within a social network or a sub-group of a social network. Thus greater cohesion, measured by the increasing numbers of ties, is associated with increasing pressures towards consensus.

Consequences of the definition further specify that the pattern of relational ties is significant. The relational ties among actors may be direct, as in face to face, or indirect, as in including intermediaries. Furthermore, relational ties may be directional or mutual; directional ties include sending and receiving ties, and mutual ties are ties that are as they are described--mutually sending and receiving. Entire networks may therefore be broken into smaller sub-groups such that those within sub-groups experience greater numbers of face to face interactions and increasing numbers of indirect relationships. "Accordingly, persons within sub-groups are predicted to be more homogeneous in terms of attitudes and behaviors than persons in different subgroups" (Friedkin, 1984).

Statement of Political Influence Network Theory:

Building upon the underlying process of social comparison and the conceptual definition of structural cohesion, a theory of political influence networks can be stated simply as follows (Knoke, 1990):

> The more cohesive a social network, the more similar the attitudes within the social network.

The cohesiveness of a social network relies upon the process of social comparison. Under this process, actors experience pressures towards attitudinal homogeneity and seek to avoid deviant behavior. If cohesiveness is operationalized as mutual ties, then increased cohesiveness as measured by mutual ties is associated with increased attitudinal homogeneity.

Scope Condition:

The theory also requires that scope conditions be specified. The key scope condition is the following: the effects of political influence networks on influencing attitude similarity occur in ambiguous or highly ideological situations (Knoke, 1990). When actors are uncertain of how

to assess a particular decision, they will view their network relations as reference and orientation points. Thus, the theoretical perspective presented here is appropriately applied to explaining how actors reach decisions under ambiguous or highly uncertain conditions.

Summary

A review of the theoretical literature tracing the relational and structural ancestry of the network perspective bring this discussion to a theory of political influence networks. The key assumptions of the theory can be summarized briefly as follows: 1) actors are interdependent, 2) relational ties permit material and nonmaterial resources to be transferred between actors, 3) network structures are conceptualized as patterns of concrete relations among actors, and 4) network structures provide opportunities as well as constraints for actors. From these assumptions, a theory of political influence networks was constructed that states that greater cohesiveness, measured as mutual ties, within a social network will result in attitudinal homogeneity among network actors. I now use the network perspective to review empirical research bearing upon Kentucky school finance reform and pressure group influence on judicial decision-making.

III. REVIEW OF THE EMPIRICAL LITERATURE

Overview

Two bodies of empirical literature are helpful in exploring how the network structures of actors influenced judicial decision making in Kentucky. The first review of literature examines studies surrounding the Kentucky school finance reform of 1989, and the second body of literature examines studies of pressure group influences on judicial decision-making. Though studies of influence networks exist in other domains (e.g. community elites: Laumann, 1978), the private interests in national policy domains (Heinz et al., 1990), and corporations (Mizruchi, 1987), I concentrate solely on those studies dealing with court litigation, because the judiciary system is a substantially different institution in its procedures of communication and influence than legislatures, corporations, or community elites.

School Finance Reform Litigation in Kentucky

The majority of studies that examined the Rose v. Council for Better Education lawsuit in Kentucky are analyses of legal theories. These studies analyzed the judges' decisions (at both trial court and Supreme Court levels) solely from a legal perspective. Substantively, these studies are unconcerned with explaining political and social factors bearing upon the case. Legalistic analyses typically rely upon a method of legal reasoning based upon analogy: the facts of the case are established, relevant constitutional law and precedent are identified, and an analogous comparison is made between the facts and the law. A number of studies have placed the legal theory of "educational efficiency" and "adequacy" employed in the Rose case within the context of the legal history of school finance litigation (Trimble and Forsaith, 1995; Underwood, 1995; Alexander, 1991; Harvard Law Review, 1991; and McUsic, 1991).

Four studies of school finance reform in Kentucky examined subsequent activities following the judicial activity. The response of the legislature included the formation and

passage of one of the most comprehensive and unprecedented educational reforms in American history--the Kentucky Education Reform Act of 1990 (KERA) and Supporting Educational Excellence in Kentucky (SEEK). These descriptive studies are substantively concerned with the response by the legislature following the court's decision (Trimble and Forsaith, 1995; Adams, 1993b; Salmon and Verstegan, 1989) or the implementation challenges of KERA (Trimble and Forsaith, 1995; Adams, 1993b; Barwick, 1989), and do not account for the political influence of actors *prior* to the decision. Methodologically, these case studies utilized a journalistic style of research examining documents and incorporating interviews; they do not attempt to employ particular social scientific methods (e.g. case study methods described by Yin, 1994).

One study examined the social and political factors surrounding school finance reform litigation in Kentucky (Dove, 1991). Dove described how key policy actors influenced judicial decision-making in the Rose v. Council case. Concerned with the central questions "what non-legal factors influenced the outcome?" and "What role did lawyers play?" Dove concluded that the following factors contributed to the unprecedented ruling: 1) resource mobilization (e.g. media and citizenry) 2) social relations (i.e. "connections"), 3) social status, and 4) heroism. This lawyer/researcher based his conclusions upon interviews and documents; methodologically Dove's study can be characterized as journalistic as the author's intent was not to produce a social scientific piece of research. Other publications, interviews, and anecdotal remarks also identified the importance of social relations and formal and informal communication channels between key actors (Sexton, 1994; Adams, 1993a; Combs, 1991).

Overall, these studies of school finance reform litigation in Kentucky identified social relations, as important social and political factors that influenced judicial decision-making. Dove's descriptive study provides the most insight into how social networks influenced the final ruling, but all studies lacked conceptual frameworks. Methodologically, the studies relied upon

qualitative descriptions which are useful in generally understanding how social influences affected decision making; however, current network analysis methods provide means to measure systematically these relations and to illuminate subtleties that may be overlooked with less precise methods. Furthermore, advances in case study research methods allow researchers to make more definitive claims regarding causal relationships (e.g. via pattern-matching or explanation-building, Yin, 1994).

Pressure Group Influence Upon Judicial Decision-Making

A limited literature that examines pressure group influence upon judicial decision-making exists within legal studies and, to a lesser extent, political science and sociology. Within legal studies, there exists two paradigms (George and Epstein, 1992) of judicial behavior: mechanical jurisprudence which is decision-making based strictly according to the law and precedence (*stare decisis*), and sociological jurisprudence (Pound, 1931) which examines decision-making from political, sociological, and psychological dimensions. Among those studies that acknowledge the importance of extra-legal factors, there is a body of literature that examines group pressures upon the judiciary. Group pressures generally take the form of influencing judicial appointments, direct involvement in litigation, and indirect involvement in litigation (Champagne et al., 1981). The most relevant works for this study focus on direct and indirect influence upon the judiciary. The earliest proponent of this view was a legal scholar, Arthur Bentley, who observed that there are:

> numerous instances of the same group pressures which operate through executives and legislatures, operating also through supreme courts and bringing about changes in law in a field above the legislatures, but short of a constitutional convention; changes which no process of legal or constitutional reasoning will adequately mediate, but which must be interpreted directly in terms of pressures of group interests (Bentley, 1908).

These studies attempt to utilize social scientific research concepts and methods and therefore are

reviewed systematically according to substantive findings, conceptualization, and methodology.

Review of Substantive Findings

Studies of direct pressure upon the court investigated how groups impact agenda setting (O'Connor and Epstein, 1984; Hakman, 1966). O'Connor and Epstein concluded that important constitutional litigation is brought to the court by organized interest groups. Hakman provided evidence minimizing the importance of organized groups in 1,176 non-commercial constitutional cases, but his findings were subsequently challenged and updated (1928-1980) showing involvement of interest groups in 63% of constitutional important cases (O'Connor and Epstein, 1984). A number of detailed case studies substantiated the involvement of interest groups in judicial agenda-setting. Within school finance Kirst and Meister (1983), Elmore and McLaughlin (1982), and Lehne (1978) documented how networks established communication channels to mobilize resources to bring about judicial activity.

The study that perhaps most similarly parallels this research is Kirst and Meister's (1983) study of policy issue networks' influence on agenda-setting. Kirst and Meister found that networks of policy actors coordinated resources to bring school finance litigation to court in numerous states. Though their study was not centrally concerned with judicial decision-making, it did address the larger issue of how networks bring attitudinal conformity among policy elites in multiple states. They concluded that policy issue networks that are centrally-driven create more similar attitudinal orientation in the form of state policy outcomes and are important for agenda setting. Furthermore, issue networks are also more important than categorical variables such as socioeconomic or political characteristics of states in agenda-setting. This study is substantively concerned with the influence of network structures upon decision making, but does not extend the network approach into the judicial decision making process.

Elmore and McLaughlin's detailed case study of California (1982) and Lehne's case study

of New Jersey school finance reform (1978) paid particular attention to the relations of key actors participating in the litigation. Elmore and McLaughlin acknowledged coalitions of legal and technical experts and the importance of "action channels" (Elmore and McLaughlin, 1982 p. 11) to mobilize interest groups in the judicial phase of Serrano vs. Priest. Lehne also described the communication advice channels between the New Jersey Supreme Court and technicians within the state department of education who were in the position to offer "particular aid alternatives [that] would look more or less attractive to justices" (Lehne, 1978 p. 138). Both case studies acknowledged the importance of communication links for formulating effective legal claims. These two studies suggest that networks can play a role in actually influencing the decision by providing the proper resources to frame the issues in a more favorable light. However, the studies were centrally concerned with describing policy formation and implementation, thus attention to specifying how networks influenced decision making was of marginal importance.

A number of other detailed case studies explored the role of organized interests in judicial activity within the United States. Issue domains in which organized interest groups have been documented as influential in the coordination and utilization of informational resources include: the elimination of restrictive covenants (Vose, 1959) and desegregation laws by the NAACP (Kluger, 1975), the abolishment of the death penalty (Metlzner, 1973), the separation of church and state (Sorauf, 1976), and the establishment of women's rights (O'Connor, 1989). These case studies further document the importance of coordinated actors in lobbying the judiciary to obtain favorable court rulings.

The studies included in this review suggest that the coordination of legal, technical, and political information have an effect on influencing judicial decisions. The studies reviewed substantively support the claims that interest groups 1) are significantly involved in setting the

agenda of some court cases, and 2) utilize networks of communication strategically to influence judicial outcomes. The studies fail to illuminate the extent to which network structural properties are associated with favorable judicial decisions and generally conclude that highly coordinated efforts do seem to result in successful judicial outcomes, thus supporting further specification and research in this direction.

Review of Conceptual Frameworks

Two main conceptual frameworks can be drawn from the empirical research reviewed here. Kirst and Meister's (1983) conception of policy issue networks falls within the theoretical framework supporting this study. Although their study discussed briefly the relational and structural underpinnings of the network approach, their application of Heclo (1978) and Schon (1971) placed emphasis on the "fluid" and "systems" attributes of networks. This study emphasizes assumptions grounded in recent relational and structural theories.

A second conceptual approach is that presented initially by Bentley termed the "group-process" approach (Bentley, 1908). Though O'Connor and Epstein (1984) and Hakman's study (1969), and the case studies (except Vose (1972)) do not espouse explicitly theoretical perspectives, they may be categorized under Bentley's Group-Process approach. Group-process theory proposes that court activity can be explained only in relation to all other connected activities i.e. group struggle, and not in terms of logic, ideas, or theories propounded by judges in their official opinions. "The law can only be what the mass of the people actually does and tends to some extent to make other people do by means of governmental agencies," argued Bentley. Vose (1972) explicitly noted in his preface that court activity is the arbitration of fundamental and ever-present rival forces or trends in our organized society. Bentley and Vose's conceptions align with social science theories of social movements driven by normative structures. However, as argued earlier, these conceptualizations leave norms as disembodied

forces lacking concrete existence. The network conceptual framework brings these norms into the relationships among concrete actors, thus providing a link between macro-level structures and micro-level actors.

Review of Methodological Strategies

Kirst and Meister (1983) described network methods, but lacked the data analysis techniques (e.g. computer programs) now available to conduct an actual network analysis. They used qualitative techniques to gain a sense of network dimensions of "leadership, structure, membership, and operation". Present methodological advances allow the quantification of these concepts. Leadership is reconceptualized as a position where Pearson-moment correlations of actors (based upon matrix algebra) determine structural equivalence (White et al., 1976). Popularity (proportion of ties sent out) and centrality (proportion of actual ties to total number of possible ties) are also more precise and measurable concepts of leadership. Membership was derived categorically and not by nomination or "snowball" techniques as preferred in current social network research (Wasserman and Faust, 1994) thus limiting the relational nature of the network analysis. These limitations compromise conclusions based upon valid measures of network structural variables.

Except for the network study conducted by Kirst and Meister, all of the other studies that examined how pressure groups influenced the flow of information to judicial decision-making were detailed qualitative case studies. They can be reviewed based upon four important case study design criteria described by Yin (1994): construct validity, internal validity, external validity, and reliability. The case studies (Elmore and McLaughlin, 1982; Kluger, 1975; Lehne, 1978; Metlzner, 1973; Sorauf, 1976; Vose, 1959) ensured construct validity by using multiple sources of evidence recorded in extensive footnotes and endnotes. The internal validity of a case study can be tested by pattern-matching; however, these studies did not make explicit attempts to

do so, nor was it their intent. The studies also were not causal or explanatory case studies but primarily descriptive, thus minimizing the importance of this criteria. External validity, the extent to which findings are generalizable to the population, is also of minimal importance, because single case studies are analytically generalizable rather than statistically generalizable; in other words inductive generalizations can be made to a theory and not to a population. Since the case studies did not attempt to test theories, analytic generalizability is inappropriate to evaluate. Finally, reliability, the repeatability of a study, in three cases (Elmore and McLaughlin, 1982; Lehne, 1978; Kluger, 1975) was ensured by providing reasonable explanations for data collection procedures in prefaces or appendices. Meltzner (1973) and Vose (1959) did not specify data collection or analysis procedures. In short, the case studies provide strong descriptive information; however, the study I present uses social network methods not employed in this body of literature and attempts to consider theoretical explanations of how organized interest groups' influence judicial decision-making.

Summary and Contributions to the Literature

A review of the empirical literature clearly shows the absence of a formal network analysis of key policy actors in Kentucky school finance reform. The proposed study contributes substantively to the body of research on Kentucky school reform, judicial decision-making, and network analysis. Conceptually, studies of group pressures on judicial decision-making do not reflect recent advances in political sociological theories of influence and structured relationships. Most focus on political resource mobilization and not specifically group pressures on decision-making or attitude formation. Methodologically, this study is among the few formal network analysis using quantitative social network analysis techniques to study policy formation within educational policy.

II. METHODS

The methods required for this network analysis involved data collection as well as data analysis. I first present an overview of data collection techniques employed in this study and then methods involved in data analysis. The data analysis section is in two parts: descriptive analysis and stochastic analysis. Descriptive methods include a variety of network analysis and graphing techniques while the stochastic methods center on log-linear analysis using multiway contingency tables and the statistical computing package GLIM (Royal Society, 1992).

Data Collection

Collection of social network data requires attention in two areas: data format and data measurement (accuracy, reliability and validity). Wasserman and Faust (1994) list basic techniques for format: questionnaires, interviews, observations, archival records, experiments and diaries. Each technique lends itself to the study of a particular substantive area; for this study, I chose archival records. Since the Kentucky case occurred in 1989, archival records are a more suitable technique for measuring past relations. A number of other studies have also reconstructed ties by examining newspapers, court cases, journal articles, and minutes (Burt, 1977, 1983). In addition, membership rosters of particular corporations have also been used to study corporate networks (Galaskiewicz, 1985).

I used published journal articles, court documents, and newspaper reports to establish relations based on the following question: "Who did you ask for advice regarding the Rose v. Council for Better Education lawsuit?" I established five criteria on which to determine the existence of an advice relationship:

- If actor "i" named actor "j" directly in a published document

- If a third party reported that actor "i" chose actor "j" for advice in a published document.
- If actor "i" and "j" were reported in a published document as members of the same organization, department, or law firm where the lawsuit was reasonably likely to be discussed.
- If actor "i" and "j" were present at the same event where advice regarding the lawsuit was reasonably likely to be exchanged.
- If actor "i" cited actor "j" as a reference in a published work from which advice regarding the lawsuit was reasonably likely to be drawn.

Based upon these five criteria, an initial list of policy actors was generated (Table 1).

[Table 1 about here]

From the list of actors, advice relations were established using the five criteria by analysis of archival sources. A table listing advice relations and the archival sources upon which those relations were established is provided in Appendix A.

Network researchers have also been concerned with data measurement--in particular accuracy, validity, reliability, and error. Concerns of accuracy stem from the fact that network research often requires asking particular actors to name other individuals with whom they have had relations. Individuals regularly forget or misreport their own interactions (Bernard, 1985). Accuracy from this perspective is less of a methodological concern, since I am reviewing already published documents. Another concern is that of validity. How can researchers be certain that the questions being asked do in fact measure what is desired? One study conducted by Moulton and associates (1955) concluded that sociometric measures, such as choices received by an actor, were related to actor leadership and effectiveness (Moulton, 1955). Though this is only one study, it provides some basis for ensuring the validity of these techniques. A final concern is that of reliability--that the repetition of measurements produces the same responses. Normally, a number of techniques can be employed to ensure reliability such as test and re-test or alternative

question formats. In this instance, reliability is ensured using a variety of published sources that are independent of one another--court documents, newspaper accounts, and articles authored independently by different sources. Network researchers have also observed that reliability tends to be higher for aggregate level conclusions rather than individual actors (Burt et al., 1985). In this case, claims regarding aggregate network structure have greater reliability than individual actor conclusions.

Data Analysis

Following the initial data collection procedures, data were analyzed using descriptive as well as stochastic techniques. The descriptive techniques included binary matrices, block-modeling, block image matrices, sociographs, and measures of centrality. The stochastic techniques allowed testing of hypothesis by statistical procedures; I used a log-linear model of multiway contingency table analysis (Wickens, 1989) to test the statistical significance of dyadic relationships in the network. I now describe both descriptive and stochastic analysis in detail.

Descriptive Analysis

1. Binary Matrices

From the table of relations constructed from published accounts of Kentucky school reform, a binary one-mode directional matrix was produced (Figure 1). The 33 x 33 binary matrix

[Figure 1 about here]

reflects the presence or absence of relationships based upon the question: "Who did you ask for advice regarding the Rose v. Council for Better Education lawsuit?" A one (1) in a cell indicates that actor "i" chose actor "j" as a source of advice. A zero (0) indicates that actor "i" did not chose actor "j" as a source of advice. The matrix was constructed such that all 33 actors in Kentucky were listed in alphabetical order down the side of the matrix and listed again across the

top of the matrix. Actors along the side, or rows, are referred to as actor "i", and actors along the top, or along the columns, are referred to as actor "j". Since the same actors were listed along the rows as well as columns, the matrix is termed "one-mode." Furthermore, the relations are directional in that actor "i" may chose actor "j", but actor "j" may not necessarily chose actor "i". (For example, Blandford chose Brock, but Brock did not choose Blandford).

A second binary matrix was extracted from the initial 33 x 33 matrix (Figure 2). The second binary matrix is a 9 x 9 matrix consisting of nine central policy actors in Kentucky: the lead defendants, the lead plaintiffs, lead policy advisors, high state government officials, and a state level court judge. Further analysis on this sub-group of elites was conducted and will be discussed in depth later.

[Figure 2 about here]

2. Block-Modeling

Blockmodeling was used to simplify the network into subsets of actors that were similarly positioned. Blockmodels "present general features of a network, such as the ties between positions, rather than information about individual actors" (White, 1976). Blockmodels identify actors that have identical ties to and from other identical actors; similar actors are termed "structurally equivalent" (Lorrain and White, 1971). A collection of such actors that are structurally equivalent is termed an "equivalence class" or "position" (Wasserman, 1994). The binary matrix was thus partitioned into equivalence classes or positions by identifying structurally equivalent actors and rearranging the actors so that they were adjacent to one another. Lines were drawn to partition the matrix into sub-groups or blocks of similar actors.

Structural equivalence can be measured mathematically in two ways: 1) Euclidean distance and 2) Correlations. Euclidean distance in social networks (Burt, 1976) measures the distance between two actors, actor "i" and actor "j" and a third actor "k". The mathematical

equation for equivalent actors in Euclidean distance results in a value approaching zero and for dissimilar actors becoming large. Correlation measures of structural equivalence rely upon the "Pearson product-moment" correlation coefficient (Wasserman, 1994) where structurally equivalent actors achieve a correlation nearing 1 and dissimilar actors nearing -1. Wasserman and Faust (1994) report that Euclidean distance measures are perhaps less sensitive to structural differences when variance is large among actors, hence I used correlation measures for structural equivalence in this study. Structural equivalence was calculated using UCINET IV under the convergence of correlation (CONCOR) procedure (Borgatti, 1991). From the blockmodel, interpretations regarding the social structure of the network can be made from a block-image matrix.

3. Block-Image Matrices

From the blockmodel, a block-image matrix was constructed. The block-image matrix allows examination of the entire configuration of ties between positions and conclusions regarding the structure of relations. Since the block-image matrix is a reduction of the blockmodel, interpreting block-image matrices allows for the consideration of more parsimonious models of the network's social structure (White, Boorman, and Breiger, 1976). To create the image matrix, the blockmodel was reduced to a binary matrix composed of rows and columns determined by the number of equivalence classes created by the blockmodeling procedure.

4. Sociographs

Sociographs were also constructed using KrackPlot 3.0 to represent visually the relationships between the key actors. Sociographs model the social network--simplifying social relations to their most essential parts (Hage, 1983). The sociograph consists of 1) points or nodes that represent actors and 2) lines connecting the points that represent relations between the

actors. I constructed "directed" sociographs meaning that the direction of ties between actors remained specified. (This is as opposed to other types of nondirectional relationships like kinship). The directed sociograph is represented by arrows connecting actors. Sociographs were constructed for the 33 x 33 matrix as well as the extracted 9 x 9 matrix of key policy actors.

5. Measures of Centrality

One final descriptive analysis technique employed here is centrality. Centrality measures how "involved" an actor is with other actors in the network. Centrality infers how important an actor is within a network, because the number of relations that an actor has suggests an ability to monitor strategically the flow of information within the network (Moreno, 1934). Centrality can be measured in various ways (Wasserman and Faust, 1994); I chose the centrality measures of "degree" and "betweeness" based upon the substantive issues of this research. I selected these measures of centrality in their non-directional forms, because monitoring by both giving and receiving of information regarding the Kentucky lawsuit are substantively more meaningful than just giving or receiving of information alone. Furthermore, centrality was calculated only for the nine key actors in the Kentucky case: lead plaintiffs, lead defendants, policy consultants, and the trial court judge. "Degree centrality" is a measure of how central an actor is within a network based upon how many ties he has relative to the total number of ties possible. "Betweeness centrality" is a measure of how central an actor is based upon the probability that information from any other two actors must pass through that actor. Centrality measures were calculated using UCINET IV (Borgatti, 1991).

Stochastic Analysis

In addition to the descriptive analysis, statistical analysis was used to evaluate the statistical significance of the distribution of network structural variables. Tests were performed on the distribution of receiving ties, sending ties, and mutual ties (ties that are both receiving and

sending) to verify that the distribution of those structures within the network were statistically significant. These tests also revealed the statistical largeness of particular actors' receiving, sending, and mutuality of ties. Most importantly, the statistical analysis allowed conclusions to be made about the cohesiveness of the network as measured by the distribution of mutual ties.

The analysis employed log-linear models to test discrete or categorical data. Model fitting with multi-dimensional contingency tables was used (see Wickens, 1989 and Wasserman and Faust, 1994 Chapter 15 for full explanations). Briefly, stochastic analysis was conducted on the 9 x 9 matrix extracted from the original 33 x 33 matrix. From the 9 x 9 binary matrix, an expanded 9 x 36 matrix was constructed. The 9 x 36 matrix expanded the columns by a factor of four to accommodate variables reflecting the four possible types of dyadic relationships: null, sending, receiving, and mutual (see Appendix B). This new Y-array was a cross-classification of four variables and thus each entry had four subscripts. The subscripts index the following:

i = actor "i", the sending actor
j = actor "j", the receiving actor
k = dyadic relationship where a tie is sent
l = dyadic relationship where a tie is received

Four models of the Y-array specifying the network relations were tested and compared with one another (Table 3). These four models developed by Holland and Leinhardt (1981) have been termed "P1" and are hierarchicly nested. The key model parameters are described below:

- Sending behavior (α): this parameter reflects the propensity for actors to send ties out to other actors, and in this particular instance, to seek advice. "Sending" is also known as expansiveness.
- Receiving behavior (β): this parameter reflects the propensity for actors to receive ties or to be chosen by others for advice. "Receiving" is also known as popularity.
- Mutuality ($\alpha\beta$): this parameter reflects the mutual sending and receiving of ties between two actors.

- CAUTION: The models specified in this analysis ought to be read with caution as the parameters expressed are actually repetitive. Note that the parameter α represents sending and the parameter β represents receiving. However, upon closer examination of the subscripts α i(k) is actually the same as α j(l). Actor "i"'s sending (subscript k) is also actor "j"'s receiving (subscript l). So the models listed in Table 3 are expanded to explicitly show the α parameters from the perspective of actor "i" as well as actor "j." The same is true for the β parameters. A practical implication here is that when interpreting the computer printouts, the estimated parameter α for actor "i" send will be the same as the estimated parameters for α for actor "j" receive.

The models tested whether or not the inclusion of each of the three parameters (sending, receiving, or mutuality) produced a better fitted model that was statistically significant when compared to the null hypothesis. Table 3 summarizes the models compared and the Goodness of Fit Statistics G^2. The differences between the Goodness of Fit Statistics and the degrees of freedom were compared with a Chi-Square table (Wickens, 1989, p. 390). In addition to model fitting, specific parameter estimates for "receiving," and "sending" were calculated for the nine key policy actors. Statistical computing was conducted using GLIM (Royal Society, 1992) computing package. Parameters are only estimated for the nine key policy actors listed in Table 4.

III. RESULTS

Descriptive Results:

Blockmodels and Image Matrices:

The blockmodel (Figure 3) and its simplification, the block image matrix (Figure 4), reveal the advice relations of the Kentucky school finance reform network. The block image matrix is a six by six matrix showing communication across classes of structurally equivalent actors. The

[Figures 3 and 4 about here]

equivalence classes can be identified in descending order: educational consultants, plaintiffs, the

Select Committee appointed by the trial court judge, the trial court judge and the state governor, the defendants, and the state supreme court. The image matrix shows that the plaintiffs reciprocated exchange of advice with four of the six groups--educational consultants, themselves, the Select Committee, and the Trial Court judge. In short, the plaintiffs had access to a number of key information resources; particularly interesting is that plaintiffs exchanged information with the trial level court, Judge Ray Corns. Unsurprisingly, they did not seek nor give advice to and from the defense team or the state supreme court.

Another important observation is the behavior of the trial court judge and his appointed Select Committee. The Judge was heavily involved in the mutual exchange of advice with plaintiffs and the Select Committee he had appointed to advise him on his ruling. Whereas the State Supreme Court neither gave nor received advice with any other group, the trial level court was involved with a number of actors sympathetic towards school finance reform.

Interestingly, no ties were made to the defense team other than reciprocated ties among defense actors themselves. In fact, the defense team was practically an isolate--similar to the Supreme Court justices--indicating that they did not have as strategic a position in the monitoring of information in the case.

Sociographs:

The sociographs (Figures 5 and 6) on the other hand provide intuitively useful and interesting representations of the network relations. Figure 5 shows the relations among all 33 actors. Immediately recognizable are three large subgroups of actors. Clockwise from the top

[Figure 5 about here]

are the defendants named in the lawsuit and their attorneys. At the bottom right is an isolated group of seven individuals--the state supreme court justices. At the bottom left are the plaintiffs, their lawyers, the trial court judge, the Select Committee appointed by the trail court judge, and

educational policy consultants.

At the center of this last group of actors are key plaintiff representatives: John Brock, Ray Corns, Kern Alexander, Arnold Guess, and Bert Combs. These actors are re-graphed in Figure 6 along with four other policy actors to detail the relations among them. Brock was a state education official initially affiliated with the defendants who converted to the plaintiffs side.

[Figure 6 about here]

Judge Ray Corns was the trial court judge sympathetic to the plaintiffs; Kern Alexander was a long-time school finance expert, educational consultant and co-author of a book written with Corns. Arnold Guess was a former state education official who coordinated plaintiffs school districts, local policy consultants, and the media. Lead council for the plaintiffs Bert Combs was also a former Governor of Kentucky. Additionally, lead defense representatives are included: William Scent, lead defense counsel, Martha Collins, Governor of Kentucky, and John Rose President Pro Tempore of the Senate. Finally, Jack Moreland, head of the Pritchard Committee, a local educational policy research group was linked closely with the plaintiffs.

Measures of Centrality:

Measures of centrality indicate which actors were heavily involved in the network and potentially which actors occupied strategic locations to control information flow. Table 2 lists centrality measures for the nine key actors. Degree centrality measures the proportional number

[Table 2 about here]

of ties to other actors; John Brock, an actor who participated both on the defense and plaintiffs sides of the lawsuit clearly had the highest centrality measure (87.50). Alexander and Guess had the next highest measures of degree centrality (62.50). The lowest measures of degree centrality belonged to defendants Rose and Scent and also the president of a local education policy group,

Jack Moreland. Betweeness centrality measures how likely an actor is located between two other actors. This measure reflects the probability that information passes through a particular actor. Here, Bert Combs, the lead plaintiff attorney and former Governor of Kentucky, had the highest betweeness centrality. Two other actors sympathetic to the plaintiffs (Alexander and Brock) also received high betweeness measures. Martha Collins, Governor of Kentucky and defendant, received a similarly high betweeness measure. Other defendants Rose and Scent received zero betweeness centrality scores. It should be noted that these measures are based upon relations only among these nine actors and not with the other 33, so caution should be exercised in their interpretation.

Stochastic

Model Fitting:

Four models were constructed and compared with one another to test for the importance of specific parameters (Table 3). Model 1 is the full model and includes parameters representing

[Table 3 about here]

an error term (λ), main effect (θ), sending of ties (α), receiving of ties (β), and mutuality of ties ($\alpha\beta$). Models 2 through 4 lack one of the parameters of interest--either sending, receiving, or mutuality. Since the models are hierarchically nested, the Goodness of Fit Statistics may be compared.

Results from the statistical analysis show that inclusion of the α parameter (sending) does not improve the model significantly ($\Delta G^2=10.54$) at the .05 level, nor does the inclusion of the β parameter for receiving ($\Delta G^2=22.88$). However, inclusion of the $\alpha\beta$ parameter (mutuality) does increase the model significantly. In fact, the significance is at the .0005 level. Thus in order to accurately describe the network social structure, the mutuality parameter must be included in the model.

Individual Actors' Parameters:

Individual actor parameter estimates for sending and receiving allow us to compare tendencies among the nine key policy actors. Table 4 reports both the sending and receiving parameter estimates that are centered around the mean. Martha Collins, the Kentucky Governor, had the highest tendency to send out ties (to seek advice) from others whereas Arnold Guess (coordinator of plaintiffs) had the least tendency to send out ties. Judge Ray Corns and lead plaintiff Bert Combs did not exhibit any strong tendency to send out ties. With respect to receiving ties, Arnold Guess had the highest tendency to receive ties; whereas, Jack Moreland (President of the Pritchard Committee, a local educational policy group) had the least tendency to receive ties. Interpretation needs to be cautioned here, because none of the values produced are statistically significant at the .05 level. This is not surprising, because the model fitting results indicated that sending or receiving ties alone did not describe the network adequately.

[Table 4 about here]

IV. DISCUSSION

This paper is centrally concerned with how the social structure of school finance reform actors contributed to the successful ruling of Kentucky's Rose v. Council for Better Education lawsuit. To this end, two main questions were posited: 1) What was the social structure of the network of school finance reform actors in Kentucky?, and 2) In what ways did the social network structure of actors influence the judicial decision of the Rose v. Council for Better Education lawsuit at the trial court level? These two questions are addressed respectively by considering the results of the descriptive and the stochastic analysis of the social network.

What was the social structure of the network of school finance reform actors in Kentucky?

The descriptive techniques employed in this network analysis suggest that the social

structure of the network of school finance reform actors initiating the lawsuit was highly mutualistic. The most useful evidence supporting this descriptive claim are the block image matrix (Figure 4) and the sociograph (Figures 5). The block image matrix shows that the plaintiffs bringing the lawsuit not only sought advice from a variety of key resources (education policy consultants, themselves, the trial courts Select Committee, and the trail court judge), but that those key resources also sought advice from the plaintiffs. Furthermore, the block image matrix shows that the trial court judge, Ray Corns, sought information regarding how reformed school finance programs were being contemplated. Additionally, the block image matrix shows that plaintiffs had access to Judge Corns with respect to his thoughts on educational policies. Examining the sociograph of all 33 policy actors further visualizes how plaintiffs, educational policy consultants, the trial court Select Committee and the trial court judge were mutually related. The fact that there was reciprocity of advice exchanged suggests that key actors were able to monitor flows of information and perhaps strategically frame their legal arguments and political interests to achieve self-interested goals.

In addition to observing the subgroups that were mutually related in the network social structure, observations of the subgroups that were NOT mutually related is perhaps just as compelling. Firstly, the subgroup of defendant actors is largely isolated from the rest of the network (upper right in Figure 5) except for access through two actors: Brock and Combs. These two actors are strategically located with respect to controlling and monitoring the flow of information to and from the defendants (betweeness centrality measures for these two actors are among the highest). Though judicial procedures require that plaintiff counsel disclose evidence to defense counsel and vice versa, the flow of critical information (e.g. strategies and dispositions of key actors) that was not necessarily subject to court proceedings could still be controlled at the discretion of central actors. Brock was initially part of the defense subgroup but upon receiving

a promotion during the course of the trial switched his position and allied himself with the plaintiffs. Combs was the lead counsel for the plaintiffs and was unquestionably regarded as a proponent of school finance reform. Considering the attitudinal direction of both of these key actors, their positions in the social structure make them powerful with respect to controlling information sought by defendants. Secondly, the isolation of particular justices also deserves attention. Whereas the state supreme court judges are isolated (lower right corner in Figure 5), the trial court judge (Corns) was heavily embedded in plaintiff actor networks. The isolation of the Kentucky State Supreme Court Justices simultaneously highlights the fact that these judicial actors were NOT deeply involved in actor networks with particular interests AND that the trail court justice, Ray Corns, was.

In what ways did the social network structure of actors influence the judicial decision of the Rose v. Council for Better Education lawsuit at the trial court level?

The descriptive techniques described above allow for general claims regarding the structure of the policy network in Kentucky; however, the stochastic models employing log-linear analysis allow for stronger claims using statistical tests. Results from Table 3 strengthen the claim that mutual dyadic relationships (ties where actors both sent and received ties from one another) were statistically significant and must be included in any model that adequately describes the network structure of the nine key policy actors. Furthermore, the statistical analysis showed that mutual relationships were significant at the .0005 level. In the case of Kentucky then, the data support the claim that mutual relationships were particularly important in the network structure of the nine key policy actors.

These stochastic models allow for a confident claim that mutual ties were particularly prevalent in this network. From this claim, evidence is established in support of the hypothesis

that school finance reform in Kentucky occurred in part due to the cooperation and mutual exchange of advice among policy actors with respect to the Rose v. Council for Bettér Education lawsuit. I do not reject other theories that attribute judicial decision-making to legalistic and other extra-legal factors such as categorical attributes; however, this study suggests that relational measures found in network structural variables may be important factors to also consider. This study supports the perspective that networks were a significant factor in the successful litigation of this very important educational event.

In this study, theories of the politics of judicial decision making are being challenged. From the empirical review, other studies of judicial decision-making have tended to measure traditional categories (e.g. reputation of lawyer, political background of judges, nature of case) across a statistical sample so that claims could be made to a population. Instead, this study is an attempt to provide evidence in support of an emerging theory of political influence networks which can be constructed and refined to explain judicial decision making in some circumstances.

As this study is a single case study, it is not statistically generalizable; rather, it is analytically generalizable. Statistically generalizable studies allow generalization to an entire population based upon random selection of samples. Analytically generalizable means that new evidence is provided to construct/reconstruct new theories or hypotheses which may then be later tested by statistically generalizable methods (Yin, 1994). Singular case studies, such as this one, provide evidence to generalize to new theories, not populations.

Conclusion:

The social network perspective highlights the importance of social structure in determining human behavior. Actors interested in policy formation among groups of individuals consequently may seek to investigate the social structure among those central to policy decisions.

While one strategy that emerges from this perspective is that of actively working to shape and control social structure, an equally important lesson is that of recognizing how the existing social structure guides the policy formation processes. In some respects, the unprecedented nature of the policy formation process in the particular case of Kentucky may have been a result of the highly cohesive social structure among Kentucky judicial policy actors. Such a radical ruling by the trial court judge might not have occurred if the social structure had not existed as it did.

As noted in the introduction, a sound legal theory presented to the courts is perhaps not enough to secure school finance reform across the states in the U.S. From these initial findings from the state of Kentucky, researchers may be motivated to investigate the role of networks among lawyers, educational policy consultants, state education officials and even justices in determining how adequate financing may be brought about for disadvantaged communities, schools, and children.

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FIGURE 1: BINARY MATRIX OF 33 KEY POLICY ACTORS IN KENTUCKY SCHOOL FINANCE REFORM NETWORK

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33
1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
2	0	0	0	1	0	1	0	1	1	1	0	1	0	1	0	1	0	1	0	1	0	1	0	0	1	0	0	0	0	0	1	1	0
3	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	1	0	0	0	0	0	0
4	0	1	0	0	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0
5	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	1	0	0	0	0	0	0
6	0	1	0	0	1	0	0	0	1	0	0	1	0	1	0	1	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1
8	0	1	0	1	0	0	0	0	0	1	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	0	
9	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	
11	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1
12	1	1	0	0	0	1	0	1	1	0	0	0	0	1	0	1	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
14	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1
16	0	1	0	0	0	1	0	1	1	0	0	1	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1
18	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0
20	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
21	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0
25	1	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
26	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	0
27	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0	0	0	0	0
28	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
30	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
31	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
32	0	1	0	1	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
33	0	0	0	0	0	0	1	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0

FIGURE 2: BINARY MATRIX OF NINE KEY POLICY ACTORS IN KENTUCKY SCHOOL FINANCE REFORM NETWORK (EXTRACTED FROM 33 X 33 BINARY MATRIX)

Alexander	0	1	0	1	1	1	1	0	0
Brock	1	0	0	1	1	1	0	0	0
Collins	0	1	0	1	0	0	0	1	1
Combs	1	0	1	0	0	1	0	0	0
Corns	1	1	0	0	0	1	0	0	0
Guess	1	0	0	1	1	0	0	0	0
Moreland	1	0	0	0	0	1	0	0	0
Rose	0	1	1	0	0	0	0	0	1
Scent	0	1	1	0	0	0	0	1	0

FIGURE 3: BLOCKMODEL OF 33 KEY POLICY ACTORS IN KENTUCKY SCHOOL FINANCE REFORM NETWORK. (Based upon Pearson product-moment correlation coefficients. Created with UCINET IV).

	2	2	2	1			1	1	2	1		3		2	1	1		3		2	2	1		2	2		1	1	2	1	3	3
1	2	1	5	2	2	9	6	8	8	4	6	1	4	0	0	3	8	2	3	7	3	9	5	6	4	7	7	1	9	5	0	3
1			1	1																												
22			1	1	1					1																						
21				1																												
25	1	1		1	1					1																						
12	1		1	1		1	1	1			1	1						1														
2		1		1	1		1	1	1		1	1	1	1	1	1		1	1													
9					1	1		1	1			1																				
16					1	1	1		1		1	1						1														
18						1	1	1																								
28		1										1																				
14		1		1		1		1	1			1																				
6					1	1	1	1	1	1	1													1								
31						1							1	1	1																	
4					1	1					1	1		1	1			1														
20						1						1	1		1																	
10						1						1	1	1																		
13																			1													
8					1	1		1				1	1	1	1				1													
32						1							1			1	1															
3													1							1		1	1	1	1							
27													1						1			1	1	1	1							
23																						1										
19													1						1	1			1	1	1							
5											1		1						1	1		1		1	1							
26													1						1	1		1	1		1							
24													1						1	1		1	1	1								
7																											1	1	1	1	1	1
17																										1		1	1	1	1	1
11																										1	1		1	1	1	1
29																										1	1	1		1	1	1
15																										1	1	1	1		1	1
30																										1	1	1	1	1		1
33																										1	1	1	1	1	1	

R-squared = 0.580

First order actor-by-actor correlation matrix saved as dataset 1STCORR
Partition-by-actor indicator matrix saved as dataset CCPART
Permutation vector save as dataset CCPERM

FIGURE 4: BLOCK IMAGE MATRIX OF EQUIVALENCE CLASSES IN KENTUCKY SCHOOL FINANCE REFORM NETWORK. (Based upon Pearson product-moment correlation coefficients. Created using UCINET IV.)

Education Finance Consultants	1	1	0	0	0	0
Plaintiffs	1	1	1	1	0	0
Select Committee to Judge Corns	0	1	1	1	0	0
Trial Court Judge Corns	0	1	1	1	0	0
Defendants	0	0	1	0	1	0
KY Supreme Court Justices	0	0	0	0	0	1

FIGURE 5: SOCIOGRAPH OF 33 KEY POLICY ACTORS IN KENTUCKY SCHOOL FINANCE REFORM NETWORK (Created with KrackPlot 3.0).

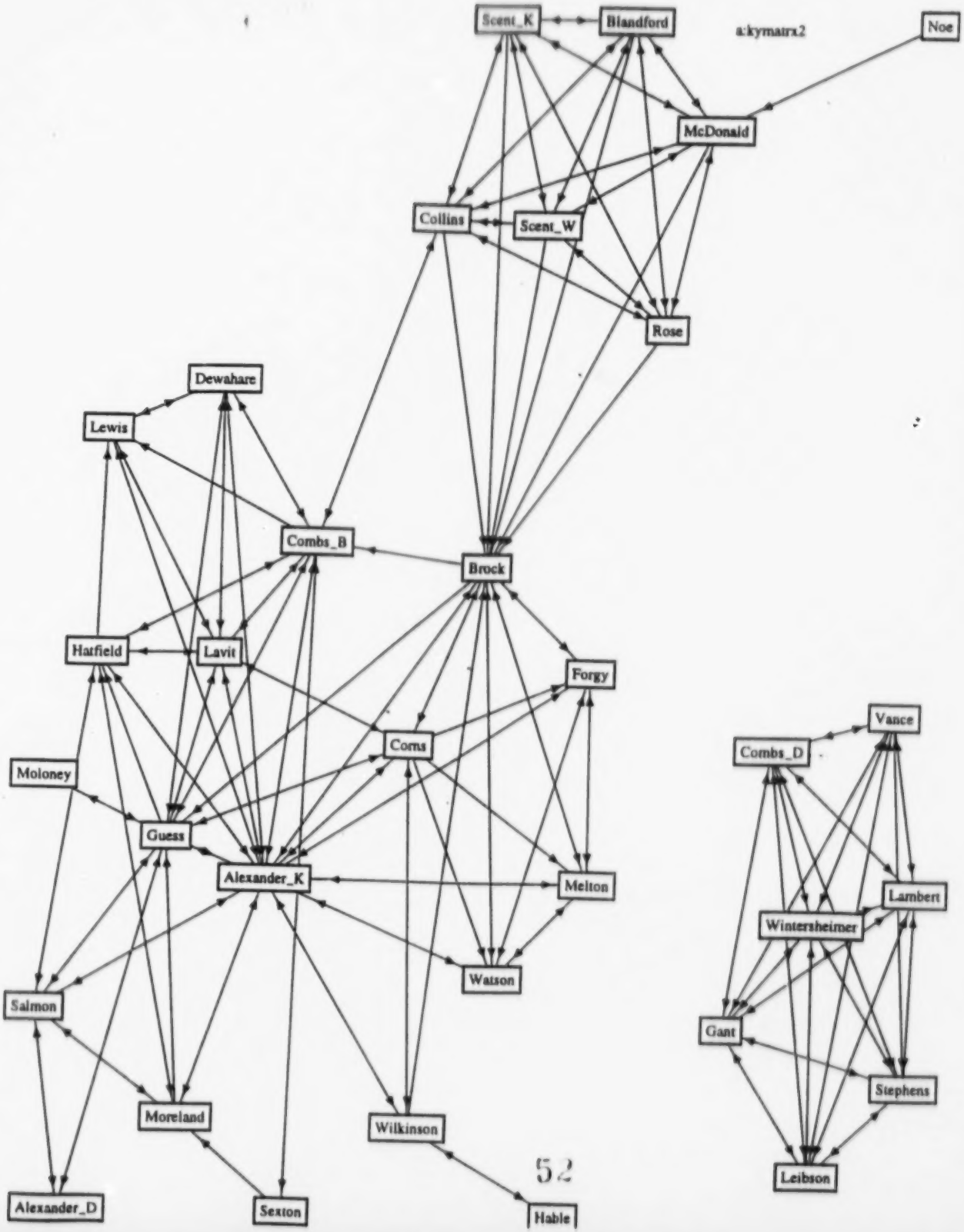

FIGURE 6: SOCIOGRAPH OF NINE KEY POLICY ACTORS IN KENTUCKY SCHOOL FINANCE REFORM NETWORK (EXTRACTED FROM 33 X 33 BINARY MATRIX). (Created using KrackPlot 3.0).

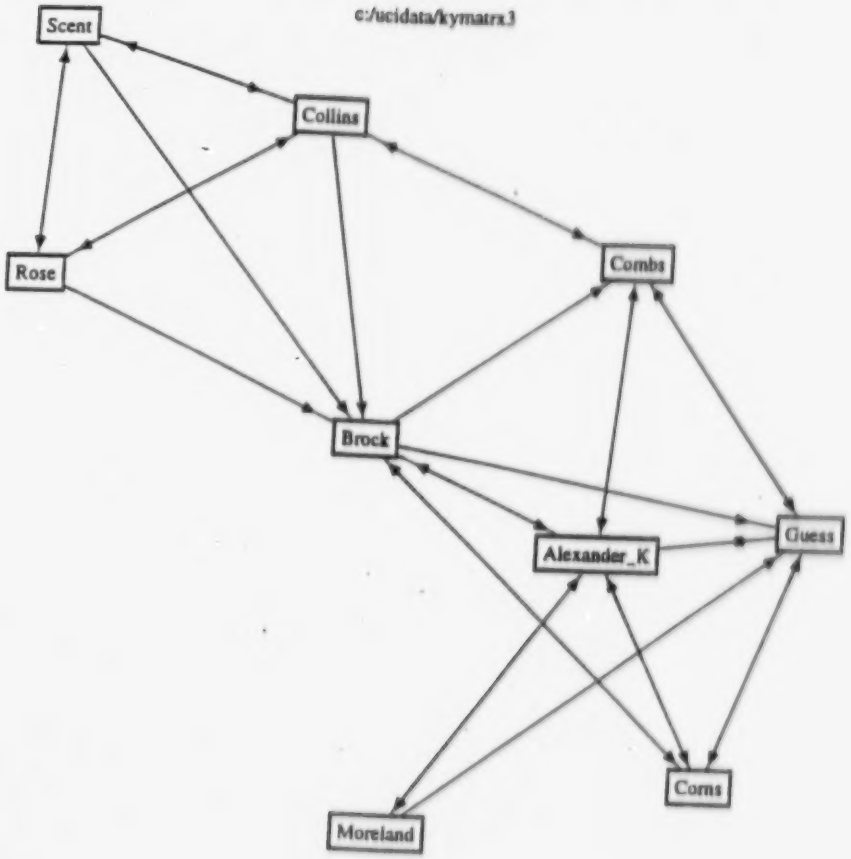

TABLE 1: SUMMARY OF 33 KEY POLICY ACTORS IN KENTUCKY SCHOOL FINANCE REFORM.

Index #	Name	Title
1	Alexander, David	Professor at Virginia Tech University
2	Alexander, Kern	President Western Kentucky University, consultant to plaintiffs and the Council for Better Education
3	Blandford, Donald	Defendant, Speaker of the House
4	Brock, John	State Superintendent of Public Instruction (#2 succeeded Alice McDonald)
5	Collins, Martha Layne	Defendant, Governor of Kentucky
6	Combs, Bert	Lead counsel for plaintiffs, former KY Governor, former Federal Court Justice
7	Combs, Dan	KY Supreme Court Justice
8	Corns, Ray	KY Trial Court Judge
9	Dewahare, Debra	Plaintiff counsel
10	Forgy, Larry	Select Committee to Judge Corns
11	Gant, William M	KY Supreme Court Justice
12	Guess, Arnold	Former KY Dept. of Education official, coordinator of plaintiff school districts
13	Hable, Kevin	Counsel to Governor Wilkinson
14	Hatfield, Frank	Superintendent of plaintiff school district
15	Lambert, Joseph E	KY Supreme Court Justice
16	Lavit, Theodore	Plaintiff counsel
17	Leibson, Charles M	KY Supreme Court Justice
18	Lewis, Thomas	Plaintiff counsel
19	McDonald, Alice	Superintendent of Public Instruction
20	Melton, James	Select Committee to Judge Corns
21	Moloney, Michael	Select Committee to Judge Corns
22	Moreland, Jack	President of the Pritchard Committee
23	Noe, Roger	House of Reps. Education Committee
24	Rose, John	Defendant, President Pro Tempore of Senate
25	Salmon, Richard	Professor Virginia Polytechnic Institute and State University, Blacksburg, Virginia
26	Scent, Karen	Defense counsel
27	Scent, William	Lead defense counsel
28	Sexton, Robert	President of Pritchard Committee (succeeded Jack Moreland)
29	Stephens, Robert	KY Supreme Court Chief Justice
30	Vance, Roy	KY Supreme Court Justice
31	Watson, Sylvia	Select Committee to Judge Corns
32	Wilkinson, Wallace	Governor of Kentucky, succeeded Martha Layne Collins
33	Wintersheimer, Donald	KY Supreme Court Justice

TABLE 2: CENTRALITY MEASURES (DEGREE & BETWEENESS) OF KEY POLICY ACTORS IN KENTUCKY SCHOOL FINANCE REFORM NETWORK.

ACTOR	DEGREE*	BETWEENESS**
Alexander, Kern	62.50	23.81
Brock, John	87.50	22.92
Collins, Martha Layne	50.00	24.11
Combs, Bert	50.00	29.46
Corns, Ray	37.50	0.89
Guess, Arnold	62.50	7.74
Moreland, Jack	25.00	0.00
Rose, John	37.50	0.00
Scent, William	37.50	0.00

* Degree centrality is a measure of how central an actor is within a network based upon how many ties he has. For example, John Brock has the most ties (7) within this particular network. The centrality of Brock is measured relative to the total number of possible ties that he can have (Since Brock can not have a tie to himself, he can have a total possible of 8 ties: g-1 or 9-1 = 8). Here, degree centrality is standardized by dividing by the total number of possible ties an actor can have. In the case of Brock, 7/8 x 100 = 87.50.

* Betweeness centrality is a measure of how central an actor is based upon that actors location between any other two actors. In other words, the betweeness centrality of actor "k" is the number of shortest possible paths (geodesics) that actor "i" can take to reach actor "j" that pass through actor "k". Here, the betweeness centrality of each actors is also standardized. (See Wasserman and Faust, 1994, p. 190 for full explanation).

TABLE 3: SUMMARY OF LOG-LINEAR MODELS, GOODNESS OF FIT STATISTICS, AND STATISTICAL SIGNIFICANCE FINDINGS OF KEY POLICY ACTOR NETWORK IN KENTUCKY.

MODEL	NULL HYPOTHESIS	G^2	ΔG^2	d.f.	Δd.f	Sig. at .0
1. Log P(Yijkl=1) = λij +θk +θl +αi(k) +αj(l) + β j(k) + β i(l) + (αβ)kl		140.77		208	-	-
2. Log P(Yijkl=1) = λij +θk +θl + + β j(k) + β i(l) + (αβ)kl	H0= α i(k) =0 for all i & k	151.31	10.54 (Model 2-Model 1)	224	16	NO *
3. Log P(Yijkl=1) = λij +θk +θl +αi(k) +αj(l) + + (αβ)kl	H0=β j(l) = 0 for all j & l	163.65	22.88 (Model 3- Model 1)	224	16	NO *
4. Log P(Yijkl=1) = λij +θk +θl +αi(k) +αj(l) + β j(k) + β i(l)	H0=αβ = 0	181.21	40.44 (Model 4-Model 1)	209	1	** YES

* Do not reject the null hypothesis. The given Chi-square value at 16 degrees of freedom is 26.30 (Wickens, 1990; p. 930). Therefore, the calculated ΔG^2 values for Model 2 (10.54) and Model 3 (22.88) are not statistically large at the .05 level. However, the Goodness of Fit statistic for Model 3 is almost statistically significant at the .10 level. These findings can be interpreted in the following way: both the α AND β parameters (expansiveness/sending AND popularity/ receiving) are not statistically significant and can be excluded from the model while retaining an accurate description of the network. In other words, there are no differential popularity or differential expansiveness effects among the actors.

** Reject the null hypothesis. The given Chi-square value at 1 degree of freedom is 3.84 (Wickens, 1990; p. 930). Therefore, the calculated ΔG^2 value for Model 4 (40.44) is statistically very large. In fact, this parameter is significant at the .0005 level. This finding can be interpreted as follows: the αβ parameter (mutuality/reciprocity) is statistically significant and must be included in any model that truly describes the network.

TABLE 4: LOG-LINEAR MODEL PARAMETER ESTIMATES OF KEY POLICY ACTORS IN KENTUCKY SCHOOL FINANCE REFORM NETWORK. α REPRESENTS "SENDING" AND β REPRESENTS "RECEIVING"

ACTOR	α *(standard error) **	β* (standard error) **
Alexander, Kern	.7515 (aliased)	.7618 (aliased)
Brock, John	-.6955 (3.164)	1.3544 (3.052)
Collins, Martha Layne	.9865 (3.206)	-.8552 (3.142)
Combs, Bert	-.0585 (3.220)	1.1189 (3.052)
Corns, Ray	-.2077 (3.304)	.0258 (3.192)
Guess, Arnold	-1.6475 (3.140)	1.9408 (2.970)
Moreland, Jack	.4192 (3.304)	-1.9312 (3.612)
Rose, John	.6926 (3.234)	-1.2542 (3.270)
Scent, William	.7540 (3.284)	-1.1612 (3.308)

* Parameters are centered around the mean. Parameters are calculated by subtracting the mean from the computed parameter estimates from the full model (see Model 1 in Table 1). The mean value of the α parameter is -.7515. The mean value of the β parameter is -.7618. When actors receive no ties from any other actors, the α parameter is equal to -∞ and that actor's parameter estimate is not included in the calculation of the mean. Similarly, if an actor sends no ties to any other actors, the β parameter is equal to + ∞ and that actor's parameter estimate is not included in the calculation of the mean. Determination if an actor falls into any of these two categories is done by examining the original matrix. In this case, every actor both gave or received at least one tie and therefore all parameters were included in the calculation of the mean.

** Parameters are not statistically significant. The standard errors are printed out from the statistical computing package. Since the full model replicates parameters (i sending is j receiving), standard error must be doubled to be corrected. Taking the ratio of the parameter estimate to the standard error produces a z score that can be compared to the normal distribution table (Wickens, 1989, p. 397) None of the values here exceed 1.96 meaning significance at the .05 level. However, the values do allow us to draw some inferences about who tends to be asked for advice more as well as who tends to ask for advice more, but without statistical confidence.

APPENDIX A: SOURCES ESTABLISHING ADVICE RELATIONSHIPS AMONG POLICY ACTORS IN KENTUCKY

Who do you ask for advice regarding the Rose v. Council lawsuit prior to June 8, 1989?
Criteria

1) **I reports choosing J** for advice in a published document
2) **Third party reports that I chooses J** for advice in a published document
3) I and J are reported/documented as **members of the same organization, board, firm** where lawsuit is likely to be discussed
4) I and J are present at same **event where advice** regarding lawsuit is likely to be exchanged
5) I cites J as a **reference in a published work** from which ideas regarding lawsuit are likely to be drawn

Actor (i)	Recipient (j)	Criteria					Source
		1	2	3	4	5	
Alexander, David	Guess		x		x		(Dove, 1991), p. 88 note 51 (May 4, 1984 Frankfort, KY)
	Salmon		x		x		(Dove, 1991), p. 88 note 51 (May 4, 1984 Frankfort, KY); (Barwick, 1989) p. 139
Alexander, Kern	Brock			x			(Alexander, 1989b) p. 142 (Select Committee)
	Combs				x		(Barwick, 1989) p. 140 (May 8, 1985)
	Corns		x			x	(Dove, 1991) p. 87 note 42, p. 96 (co-authored Public School Law)
	Dawahare				x		(Dove, 1991) p. 91 (Tarrant, Wyatt & Combs)
	Forgy			x			(Alexander, 1989b) p. 142 (Select Committee)
	Guess		x	x			(Dove, 1991) p. 87 note 41, 42; p. 88 note 48 (Nat'l Ed Finance Project)
	Hatfield				x		(Barwick, 1989) p. 140 (5/8/85)
	Lavit		x	x			(Dove, 1991) p. 87 note 41, 42; p. 91 (Tarrant, Wyatt & Combs); (Barwick, 1989) p. 140 (5/8/85)
	Lewis				x		(Dove, 1991) p. 91 (Tarrant, Wyatt & Combs); (Barwick, 1989) p. 140 (5/8/85)
	Melton			x			(Alexander, 1989b) p. 142 (Select Committee)
	Moreland				x		(Barwick, 1989) p. 140
	Salmon				x		(Alexander, 1991) p. 363 note 94 (court testimony); (Barwick, 1989) p. 138 (co-author, An Opportunity for Excellence)
	Watson			x			(Alexander, 1989b) p. 142 (Select Committee)
	Wilkinson		x				(Dove, 1991) p. 99
Blandford, Donald	Brock			x			(Supreme Court, 1989)
	Collins			x			(Supreme Court, 1989)
	McDonald			x			(Supreme Court, 1989)
	Rose			x			(Supreme Court, 1989)
	Scent, Karen			xx			(Supreme Court, 1989)
	Scent, William						(Supreme Court, 1989)
Brock, John	Alexander, Kern			x			(Dove, 1991) p. 98; (Alexander, 1989b) p. 142 (Select Committee)
	Combs, Bert			x			(Dove, 1991) p. 98
	Corns		x		x		(Cropper, 1988a) (7/6/88)
	Forgy			x			(Alexander, 1989b) p. 142 (Select Committee)
	Guess, Arnold			x			(Dove, 1991) p. 98
	Melton			x			(Alexander, 1989b) p. 142 (Select Committee)
	Watson			x			(Alexander, 1989b) p. 142 (Select committee)
	Wilkinson		x		x		(Cropper, 1988a) (7/6/88)

Collins, Martha Layne	Combs, Bert				x		(Dove, 1991) p. 93 (summer of 1985)
	Blandford			x			(Supreme Court, 1989)
	Brock			x			(Supreme Court, 1989)
	Collins			x			(Supreme Court, 1989)
	McDonald			x			(Supreme Court, 1989)
	Rose			x			(Supreme Court, 1989)
	Scent, Karen			x			(Supreme Court, 1989)
	Scent, William			x			(Supreme Court, 1989)
Combs, Bert	Alexander, Kern		x		x		(Dove, 1991) p. 91; (Barwick, 1989) p. 140 (5/8/85)
	Armstrong				x		(Barwick, 1989) p. 139 (Febraury 26, 1985)
	Collins	x		x	x		(Dove, 1991) p. 93 (summer of 1985)
	Dewahare		x				(Combs, 1991) p. 4 note 11
	Guess	x		x	x		(Dove, 1991) p. 90 (October 3, 1984); p. 115; (Barwick, 1989) p. 139; (Adams, 1993) p. 9
	Hatfield				x		(Barwick, 1989) p. 140 (5/8/85)
	Lewis				x		(Barwick, 1989) p. 140 (5/8/85)
	Lavitt			x			(Combs, 1991) p. 4 note 11; (Barwick, 1989) p. 140 (5/8/85)
	Sexton						(Dove, 1991) p. 111
Combs, Dan	Gant			x			(Supreme Court, 1989)
	Lambert			x			(Supreme Court, 1989)
	Leibson			x			(Supreme Court, 1989)
	Stephens			x			(Supreme Court, 1989)
	Vance			x			(Supreme Court, 1989)
	Wintersheimer			x			(Supreme Court, 1989)
Corns, Ray	Alexander, Kern		x			x	(Dove, 1991) p. 87 note 42; p.96 (co-authored Public School Law); p. 99 (select committee); p. 113; (Jennings, 1989)
	Guess		x				(Dove, 1991) p. 87 note 42
	Lavit		x				(Dove, 1991) p. 87 note 42; p. 113
	Brock		x		x		(Alexander, 1989b); (Cropper, 1988b); (Cropper, 1988a) (7/6/88)
	Forgy		x				(Alexander, 1989b); (Cropper, 1988b)
	Melton		x				(Alexander, 1989b); (Cropper, 1988b)
	Watson		x				(Alexander, 1989b)
	Wilkinson		x		x		(Cropper, 1988a) (7/6/88)
Dewahare, Debra	Alexander, Kern				x		(Dove, 1991) p. 91 (T, W & C)
	Combs, Bert				x		(Barwick, 1989) p. 136
	Guess				x		(Barwick, 1989) p. 136
	Lavit				x		(Dove, 1991) p. 91 (T, W & C); (Barwick, 1989) p. 136
	Lewis				x		(Dove, 1991) p. 91 (T, W & C)
Forgy, Larry	Alexander, Kern				x		(Alexander, 1989b) p. 142 (Select Committee)
	Brock				x		(Alexander, 1989b) p. 142 (Select Committee)
	Melton				x		(Alexander, 1989b) p. 142 (Select Committee)
	Watson				x		(Alexander, 1989b) p. 142 (Select Committee)
Gant, William M	Combs, Dan			x			(Supreme Court, 1989)
	Lambert			x			(Supreme Court, 1989)
	Leibson			x			(Supreme Court, 1989)
	Stephens			x			(Supreme Court, 1989)
	Vance			x			(Supreme Court, 1989)
	Wentersheimer			x			(Supreme Court, 1989)

Guess, Arnold	Alexander, David		x		x		(Dove, 1991) p. 88 note 51 (May 4, 1984 Frankfort, KY)
	Alexander, Kern		x	x			(Dove, 1991) p. 87 note 41, 42; p. 88, note 48 (Nat'l Ed Finance Project)
	Armstrong				x		(Barwick, 1989) p. 139 (February 26, 1985)
	Combs		x				(Dove, 1991) p. 89, p. 90 (October 3, 1984); (Barwick, 1989) p. 136; (Adams, 1993) p. 9
	Corn		x				(Dove, 1991) p. 87 note 42
	Dawahare				x		(Barwick, 1989) p. 136
	Hatfield				x		(Barwick, 1989) p. 136
	Lavit		x		x		(Dove, 1991) p. 87 note 41, 42; (Barwick, 1989) p 136
	Moloney		x				(Dove, 1991) p. 88 note 49; (Barwick, 1989) p. 136
	Moreland		x				(Dove, 1991) p. 88 note 51 (May 4, 1984 Frankfort, KY)
	Salmon		x				
Hable	Wilkinson			x			
Hatfield, Frank	Alexander, Kern				x		(Barwick, 1989) p. 140
	Combs, Bert				x		(Barwick, 1989) p. 140
	Lavit				x		(Barwick, 1989) p. 140
	Lewis				x		(Barwick, 1989) p. 140
	Moreland				x		(Barwick, 1989) p. 140
	Salmon				x		(Barwick, 1989) p. 140
Lambert, Joseph E.	Combs, Dan			x			(Supreme Court, 1989)
	Gant			x			(Supreme Court, 1989)
	Leibson			x			(Supreme Court, 1989)
	Stephens			x			(Supreme Court, 1989)
	Vance			x			(Supreme Court, 1989)
	Wintersheimer			x			(Supreme Court, 1989)
Lavit, Theodore	Alexander, Kern		x		x		(Dove, 1991) p. 87 note 41, 42; p. 91 (Wyatt, Tarrant & Combs); (Barwick, 1989) p. 140 (5/8/85)
	Combs, Bert		x	x			(Barwick, 1989) p. 136; (Barwick, 1989) p. 140 (5/8/85)
	Corns		x		x		(Dove, 1991) p. 87 note 42, p. 113
	Dawahare			x			(Dove, 1991) p 91 (Wyatt, Tarrant & Combs); (Barwick, 1989) p. 136
	Guess		x		x		(Dove, 1991) p. 87 note 41, 42; (Barwick, 1989) p. 136
	Hatfield				x		(Barwick, 1989) p. 140 (5/8/85)
	Lewis			x	x		(Dove, 1991) p. 91 (Wyatt, Tarrant & Combs); (Barwick, 1989) p. 140 (5/8/85)
Leibson, Charles M.	Combs, Dan			x			(Supreme Court, 1989)
	Gant			x			(Supreme Court, 1989)
	Lambert			x			(Supreme Court, 1989)
	Stephens			x			(Supreme Court, 1989)
	Vance			x			(Supreme Court, 1989)
	Wintersheimer			x			(Supreme Court, 1989)
Lewis, Thomas	Alexander, Kern				x		(Dove, 1991) p. 91 (Wyatt, Tarrant & Combs)
	Dawahare				x		(Dove, 1991) p. 91 (Wyatt, Tarrant & Combs)
	Lavit				x		(Dove, 1991) p. 91 (Wyatt, Tarrant & Combs)
McDonald, Alice	Noe		x				(Dove, 1991) p. 89
	Brock			xx			(Supreme Court, 1989)
	Blandford			x			(Supreme Court, 1989)
	Collins			x			(Supreme Court, 1989)
	Rose			x			(Supreme Court, 1989)
	Scent, Karen			x			(Supreme Court, 1989)
	Scent, William						(Supreme Court, 1989)

Melton, James	Alexander, Kern			x			(Alexander, 1989b) p. 142 (Select Committee)
	Brock			x			(Alexander, 1989b) p. 142 (Select Committee)
	Forgy			x			(Alexander, 1989b) p. 142 (Select Committee)
	Watson			x			(Alexander, 1989b) p. 142 (Select Committee)
Moloney, Michael	Guess		x		x		(Dove, 1991) p. 88 note 49; (Barwick, 1989) p. 136
Moreland, Jack	Alexander, Kern		x		x		(Barwick, 1989) p. 140; (Courier-Journal, 1989)
	Guess				x		
	Hatfield				x		(Barwick, 1989) p. 140
	Salmon				x		(Barwick, 1989) p. 140
Noe, Roger	McDonald, Alice		x				(Dove, 1991) p. 89
Rose, John	Blandford			x			(Supreme Court, 1989)
	Brock			xx			(Supreme Court, 1989)
	Collins			x			(Supreme Court, 1989)
	McDonald			x			(Supreme Court, 1989)
	Scent, Karen			x			(Supreme Court, 1989)
	Scent, William						(Supreme Court, 1989)
Salmon, Richard	Alexander, David		x		x		(Dove, 1991) p. 88 note 51 (May 4, 1984 Frankfort, KY); (Barwick, 1989) p. 139
	Alexander, Kern				x		(Barwick, 1989) p. 138 (co-authored An Opportunity for Excellence); (Barwick, 1989) p. 140
	Guess		x		x		(Dove, 1991) p. 88 note 51 (May 4, 1984 Frankfort, KY)
	Hatfield				x		(Barwick, 1989) p. 140
	Moreland				x		(Barwick, 1989) p. 140
Scent, Karen	Blandford			x			(Supreme Court, 1989)
	Brock			x			(Supreme Court, 1989)
	Collins			xx			(Supreme Court, 1989)
	McDonald			x			(Supreme Court, 1989)
	Rose			x			(Supreme Court, 1989)
	Scent, William						(Supreme Court, 1989)
Scent, William	Blandford			xx			(Supreme Court, 1989)
	Brock			x			(Supreme Court, 1989)
	Collins			x			(Supreme Court, 1989)
	McDonald			x			(Supreme Court, 1989)
	Rose			x			(Supreme Court, 1989)
	Scent, Karen						(Supreme Court, 1989)
Sexton, Robert	Combs, Bert			x			(Dove, 1991) p. 111 (Pritchard Committee)
	Guess			x			
Stephens	Combs, Dan			x			(Supreme Court, 1989)
	Gant			x			(Supreme Court, 1989)
	Lambert			x			(Supreme Court, 1989)
	Leibson			x			(Supreme Court, 1989)
	Vance			x			(Supreme Court, 1989)
	Wintersheimer			x			(Supreme Court, 1989)

Vance, Roy	Combs, Dan			x			(Supreme Court, 1989)
	Gant			x			(Supreme Court, 1989)
	Lambert			x			(Supreme Court, 1989)
	Leibson			x			(Supreme Court, 1989)
	Stephens			x			(Supreme Court, 1989)
	Wintersheimer			x			(Supreme Court, 1989)
Watson, Sylvia	Alexander, Kern			x			(Alexander, 1989b) p. 142 (Select Committee)
	Brock			x			(Alexander, 1989b) p. 142 (Select Committee)
	Forgy			x			(Alexander, 1989b) p. 142 (Select Committee)
	Melton			x			(Alexander, 1989b) p. 142 (Select Committee)
Wilkinson, Wallace	Alexander, Kern		x				(Dove, 1991) p. 99
	Brock		x		x		(Cropper, 1988a) (7/6/88)
	Corns		x		x		(Cropper, 1988a) (7/6/88)
	Hable		x				(Courier-Journal, 1988)
Wintersheimer, Donald	Combs, Dan			x			(Supreme Court, 1989)
	Gant			x			(Supreme Court, 1989)
	Lambert			x			(Supreme Court, 1989)
	Leibson			x			(Supreme Court, 1989)
	Stephens			x			(Supreme Court, 1989)
	Vance			x			(Supreme Court, 1989)

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APPENDIX B: "GLIM" Statistical computing program used to test log-linear models of Kentucky school finance reform network.

```
$C Victor Kuo
$C 1997
$C
$C THIS IS A GLIM PROGRAM ADAPTED FROM WASSERMAN & FAUST 1994
$C ON PAGE 666 THAT MODELS THE DICHOTOMOUS MATRIX FOR A
$C DIRECTIONAL RELATIONSHIP NETWORK.
$C
$C THE BINARY MATRIX BELOW IS A 9 X 36 MATRIX FOR 9 KEY POLICY ACTORS IN
$C KENTUCKY'S SCHOOL FINANCE REFORM.  THE 9 X 36 MATRIX IS EXPANDED OUT
$C FROM THE ORIGINAL 9 X 9 MATRIX BECAUSE FOR EACH RELATIONSHIP,
$C ACTOR I AND J, FOUR POSSIBLE DYADIC RELATIONSHIPS EXIST:
$C
$C NO OR NULL RELATIONSHIP
$C ASSYMETRIC RELATIONSHIP WHERE I SENDS TO J OR J RECEIVES FROM I
$C ASSYMETRIC RELATIONSHIP WHERE J SENDS TO I OR I RECEIVES FROM J
$C MUTUAL RELATIONSHIP WHERE I AND J RECIPROCATE SENDING AND RECEIVING
$C
$C
$C FIT MODELS TO THE Y-ARRAY
$ECHO
$UNITS 324
$FACTOR I 9 J 9 S 2 R 2
$CALC I=%GL(9,36) : J=%GL(9,4) : S=%GL(2,2) : R=%GL(2,1)
$DATA Y
$READ
 0 0 0 0 0 0 0 1 1 0 0 0 0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 1 1 0 0 0 1 0 0 0
 0 0 0 1 1 0 0 0 0 1 0 0 0 0 1 0 0 0 0 1 0 0 1 0 1 0 0 0 0 1 0 0 0 1 0 0
 1 0 0 0 0 0 0 1 0 1 0 0 0 0 0 0 1 1 0 0 0 1 0 0 0 1 0 0 0 0 0 0 1 0 0 0 1
 0 0 0 1 0 1 0 0 0 0 0 0 1 1 0 0 0 1 0 0 0 0 0 0 0 1 1 0 0 0 1 0 0 0 1 0 0 0
 0 0 0 1 0 0 0 1 1 0 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 1 1 0 0 0 1 0 0 0 1 0 0 0
 0 0 0 1 0 1 0 0 1 0 0 0 0 0 0 0 1 0 0 0 1 1 0 0 0 0 0 1 0 0 1 0 0 0 1 0 0 0
 0 0 0 1 1 0 0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 0 0 0 1 0 1 0 0 0 1 0 0 0 1 0 0 0
 1 0 0 0 0 0 0 1 0 0 0 0 0 1 1 0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 0 0 0 1
 1 0 0 0 0 0 0 1 0 0 0 0 0 1 1 0 0 0 1 0 0 0 1 0 0 0 1 0 0 0 0 0 0 0 1 0 0 0 0

$C END THE DATA
$YVAR Y $LINK L $ERROR P
$FIT I*J + I*S + J*R + J*S + I*R + S*R $DISPLAY MDAR
$FIT I*J +             J*S + I*R + S*R $DISPLAY MDAR
$FIT I*J + I*S + J*R +             S*R $DISPLAY MDAR
$FIT I*J + I*S + J*R + J*S + I*R       $DISPLAY MDAR
$STOP
```